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ABSTRACT

The history of competency testing and legal issues related to it are reviewed briefly in light of the responsibility of school districts for providing remediation programs for students who have failed the test. The mathematics competencies of the state of Idaho are identified and keyed to four sets of readily available, secondary level Apple compatible software packages. These packages have been analyzed for flexibility and ease in student/teacher use. Several programs for implementation of computer assisted instruction (CAI) in remediation are suggested with guidelines for administrators in selecting from available options and for teachers in using the program for remediation purposes. (Author)

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Boise State University
School of Education
Graduate Program

This Graduate Preface and the
Accompanying Product for the
Master of Arts in Education

by

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SE 045 741

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A UNIT OF STUDY : APPLICATION OF COMPUTER SOFTWARE TO THE IDAHO PROFICIENCY MATH TEST COMPETENCIES.

by

THOMAS JEFFREY SPADAFORE

A Project Presented in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts / Science
in
Education

SE 045 741

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APPLICATION OF COMPUTER SOFTWARE TO THE IDAHO PROFICIENCY MATH EXAM COMPETENCIES

by

Tom J. Spadafore

The history of competency testing and legal issues related to it are reviewed breifly in light of the responsibility of school districts for providing remediation programs for students who have failed the test. The mathematics competenicies of the state of Idaho are identified and keyed to four sets of readily available, secondary level Apple compatible software packages. These packages have been analyzed for flexibility and ease in student /teacher use. Several programs for implementation of computer assisted instruction (CAI) in remediation are suggested with guidelines for administrators in selecting from available options and for teachers in using the program for remediation purposes.

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CHAPTER I

INTRODUCTION

One of the major issues facing education today has been labeled "excellence in education." It is not a new issue but it is one that seems to be recurrent. The last time excellence in education received national attention was in the early 1960's with the "new curriculum" such as the New Math and the New Science movements. During the 1970's, competency testing was added as a major component of this and was reflected in educational strategies ranging from teaching objectives to testing.

Reports of education in the 1980's have again brought the issue of excellence to the public arena. In Idaho pressure on legislators at the state level has demanded that some form of competency testing of basic skills be implemented in the school curriculum. Legislators have all but required that competency testing be connected to funding for local school districts. This legislation is intended to insure excellence in basic skills, but the haunting question is this will it insure the excellence of the overall education students receive?

Competency testing is being administered in some form in forty - nine of the fifty states. (Pipho, 1983) The focus of this study is Idaho students who do not pass the math section of the Idaho Proficiency Exam administered in the eight grade. This is an area that needs to be examined as there is an immediate need for remediation of those students in relation to the Idaho Proficiency Exam.

It has been shown that a computer, the right software, and a teacher should be able to remediate any specific deficiency in basic math skills. With guidance in how to use computer software for remediation, students and teachers will both benefit. This will minimize the loss of valuable time in developing and implementing a remedial program.

As mathematics is sequential in nature and has little variation in the subject matter, it will be used as the subject of study in this pilot project. If computer assisted instruction (CAI) will work with the remediation of

math, then similar programs could possibly be developed in other skill areas of the curriculum such as reading comprehension, writing skills, and spelling.

If an instructional CAI program in the classroom can aid the teacher and the student in remediation, it will allow the teacher to continue with the regular curriculum in his or her classroom. The purpose of this project will be to key the 26 competencies on the Idaho proficiency math test to four computer software packages that can be used for remediation. The software packages are Minnesota Educational Computing Consortium (MECC), Milliken math software series, Sunburst Communication software (SBC) and the Microcomputer Curriculum Project of the Price Laboratory School (MCPPLS). A pamphlet with instructions for teachers on how to use this software for remediation purposes shall be developed.

The review of literature will provide support for a better understanding of current competency testing policies, legal implications, special populations and remediation programs. The combined efforts of the teacher, the computer, and software packages will provide a unique remediation curriculum.

Definitions

1) **Microcomputer** - A personal computer; a complete computer built with large scale integrated circuit chips.

2) **Disk Drive** - A storage device using a large flat magnetic disk for computer storage.

3) **Floppy Disk** - A flexible, flat circular piece of magnetic material for storing information. It is the most common external storage medium for personal computers.

4) **Monitor** - A high resolution television set without a speaker, channel selector, or radio frequency receiver.

5) **Software** - The set of programs that tells a computer what to do; many include the documentation such as books or manuals as a necessary part of a the software.

6) **Software package** - A commercialspecial purpose computer program.

7) **CAI** - Computer assissted instruction.

8) **MECC** - Minnesota Educational Computing Consortium, which provides computing products of two types, classroom courseware and training and utility programs. These products usually consist of a diskette and support documentation. The products are designed for use by a student, an educator, or a programmer.

9) **SBC - SUNBURST COMMUNICATIONS** - "Survival Math", a set of four computer programs, simulates realistic situations and is designed to motivate students in the grades seven - twelve to become actively involved in developing their mathematical skills.

10) **Milliken Computer Software** - Software developed by Milliken Publishing1100ResearchBoulevard Company, St. Louis, Missouri 63132.

11) **MCPPLS** - Microcomputer Curriculum Project of the Price Laboratory - University of Northern Iowa Cedar Falls, Iowa, a grant provided by the federal goverrment to develop computer assisted instruction materials.

12) **Remediation** - Process intended to correct problems in reading, math and writing.

13) **Competency Test** - A test of Basic skills required by a government mandate or local school distirct mandate; basic competency may vary from district to district and from state to state.

Limitation

This project is limited to providing computer assisted instruction (CAI) remediation materials for those students who have failed the Idaho Proficiency Math Exam and require specific remedial instruction. It may or may not be adaptable to other populations.

CHAPTER II

Review of Literature

In May 1983, The National Commission on Excellence in Education published a report titled A Nation at Risk. This report reviewed data about the public education that our children have been receiving. Some critical statistics of the commission's report are as follows: 1) Twenty - three million American adults are functionally illiterate in the simplest form of everyday reading, writing and comprehension. 2) About thirteen percent of all seventeen year olds in the United States can be considered functionally illiterate; and 3) among minority youth, illiteracy may run as high as forty percent. The main thrust of this report is to show that the United States is becoming a nation of illiterate people and that the public school system is " mediocre." (A Nation at Risk, 83).

Looking back eleven years, the picture of the decline in public education becomes clearer. In 1972, public education was put on trial; a court case by a " Peter Doe " was the first educational malpractice law suit in the United States. The charge was that the fifth grade reading level the student had obtained by the twelfth grade was inadequate for him to hold a job in our society. This case was decided in favor of the plaintiff, creating a cry for reform of the public school system (Tractenberg & Khan, 1979).

In essence this 1972 court case brought about the introduction of what has come to be known as competency testing or proficiency testing in most states. Along with the new testing came legislation and state board policies mandating that minimum competency testing be implemented into state curriculum. Again, this was a first for the public school system in that curriculum reform was being attempted almost solely by legislation and state mandates(Pipho, Hadley 80, 84).

There are forty - nine states that have some form of minimum competency testing: twenty-six are state mandates, ten are local mandates, and five are a combination of both state and local mandates.

Twenty - two of these states combine high school graduation requirements and competency testing; seven states tie grade promotion to competency testing; and twenty - two states have some form of remediation programs (Roeber, 1984).

Of all fifty states, Oklahoma is the only state that does not have state or local mandate for competency testing. From 1975 to 1980 thirty-eight states had taken some form of action in implementing competency testing. This was seen as a way to stop functionally illiterate students from receiving a high school diploma(Pipho, Hadley, 1984).

The resounding efforts of legislators, state boards, and local school officials implemented competency testing and led them to believe they had identified all functionally illiterate individuals in the public school system. What these officals did not realize is that they had brought about new legal implications (Pipho, 1980).

The legal implications that states and local schools faced began when Debra P., a black, eleventh grade Florida public school student, filed charges against the state of Florida (Tractenber 1978). She charged that the state could not impede her graduation due to a minimum competency test. It was found that her constitutonal, equal protection, due process, racial, and phase -in- time rights were violated (Tractenberg & Kahn, 1979). The decision was rendered in Debra P.'s favor and the issue of combining graduation requirements and basic competency test was nullified.

This landmark case with Judge Carr set the following precedents: 1) That there must be a phase -in- time period for competency testing so that students can prepare themselves to take a competency test. 2) That an adequate phase -in- time related to competency testing, in this case, would be four to six years. 3) That there should be some uniformity in state wide testing. 4) That specific objectives in relation to the competency test should be stated. 5) That black students who were left with an inferior education because of segregation should not be expected to obtain the same standard scores on basic proficiency tests (Tractenberg & Kahn, 1979).

Judge Carr's fifth decision produced new issues in relation to competency testing regarding special populations: bilingual students, handicapped students, economically deprived students and students that may fall into an "other" category. This decision has left most states in a position of excluding "special populations" from taking any kind of competency test (Tractenberg, 1979).

Some states are using individualized educational plans for handicapped or for other special populations as a substitute for competency testing. No decisions have been rendered on their future. By Judge Carr's decision schools were forced to reevaluate their strategies in the implemention of competency testing. Judge Carr's landmark case was one reason that competency testing slowed drastically between the years of 1978-80. His phase - in - time decision had stopped the initial purpose of competency testing which was to combine a high school diploma with the successful passage of a basic competency test (Chall, 1979).

Those states wanting to withhold a student's diploma for failure to pass a basic competency test could not do so until 1982-83. The overall message that Judge Carr had for all educational authorities was to " implement minimum competency testing programs with all possible professional care and skill. Their primary objective should be to provide maximum educational benefits to all students and to keep to an absolute minimum harm inflicted upon students through the use of minimum competency testing programs" (Carr, 79).

Having already spent millions of dollars on legislation, implementation of basic competency programs, and court cases, the states asked what direction the public schools should take. Their efforts to implement competency programs to insure that students had basic skills before graduation were terminated, in effect, by the same people demanding that graduating students be functionally literate. The court ruling did slow many states in the implementation of competency based testing as a graduation requirement, and did, in effect, force states to reevaluate their competency programs(Pipho, 79).

In reevaluating their competency testing programs, most states slowed testing at the secondary level and created what twenty - seven states now call "early warning" systems(Pipho, 80). This early warning system provides information to teachers so that students having problems with basic skills are identified early in their academic careers and can receive the necessary help to correct a learning problem. In fact, twenty states now start testing at the third grade level or earlier (Pipho,1980). For example,South Carolina starts testing as early as preschool and seven other states start testing at fourth grade.

The early warning was one result that came from states having to reevaluate their competency testing strategies. The other result was remediation for students failing the competency test in their state. See Table IV for grade areas to be assessed by states (Pipho, 1980).

As of July 1984, there were only twenty - one states that offer some type of remediation to students failing a basic competency test and all twenty - one programs were controlled by the local school districts. There are few state or local mandates that require any type of remediation to students failing a competency test (Pipho & Hadley, 1984).

Florida was the first state to implement competency testing resulting in the Debra P. court case, but Florida, it seems, has learned from the court case. Its legislature enacted a bill called the " Thirteenth Year Program." The program provides a thirteenth year of public education for those students who fail to pass the basic competency test in Florida. The students are enrolled in remedial classes that teach basic skills needed to pass the Florida competency test (Brickell, 1980).

In Idaho law states that:

> Those students who fail to obtain satisfactory scores shall be provided remedial and/or tutorial services during the regular school day in the subject areas in which the test indicates a deficiency exists.
> The individual students shall be provided the necessary services by the local school districts from the time of the initial testing until such time as the results of the proficiency tests are deemed satisfactory(Pipho,80 pp. 29).

This mandate for Idaho creates a unique situation in that the implementation of a CAI remediation program in math could be incorporated into the student's classroom remedial work. In 1984 a record number 13,533 students took the Idaho Proficiency Exam. While only 56% of the students passed all four parts, it was found that most scores were higher than the previous year. The following are the percentage results of students who passed the Idaho Proficiency Exam in the last six years (News & Report , 84).

	1979	1980	1981	1982	1983	1984
Reading	87.6%	89.2%	90.2%	91.2%	92.0%	88.1%
Writing	90.8%	90.1%	67.3%	78.4%	79.0%	79.9%
Mathematics.	79.1%	77.6%	76.0%	78.3%	80.3%	78.9%
Spelling.....	66.8%	79.6%	78.4%	78.0%	77.5%	81.0%

A total of 7,578 students passed all four parts of the Idaho proficiency test in 1984; that leaves 5,950 students (2720 which were math failures) needing some form of remediation. As indicated by the chart above, in 1984 math scores fell in comparison to 1983. The need for a monitored remediation program in Idaho for teaching basic skills would seem clear at this time, as test scores are showing signs of inadequacy in relation to math (News & Report,84).

Idaho, with its unique mandate of remediation, could eliminate a vast amount of the legal implications that surround the segregation issue of competency testing. CAI can become a valuable asset in math with the remediation process for the Idaho Proficiency Test in math. Students, teachers, and administrators can benefit from the CAI program if an early warning system of evaluating student progress could be implemented. CAI in remediation programs and the correct software may help avoid the extra cost of a thirteenth year, such as Florida's (Turlington, 1979).

Most states anticipate the day when they will have to permit students to take a competency test at any time during their life (Pipho, 1980). The ultimate result of this will produce a financial burden for the public schools and states. In the final analysis, how will the public schools and the states handle the remediation of failing students in relation to competency tests? This question is not likely to be answered for many years. Hopefully it will be handled in a more successful way than it has been in the past (Pipho, 1980).

One way in which schools and states could remediate students that fail basic competency tests is through the use of computer assisted instruction. Numerous attempts in the past fifteen years have been made to show the effectiveness of computer assisted instruction (Fass, 1982). Many problems in the past have hampered the accuracy and the value of computer assisted instruction (CAI). Poor research designs, vested interests on the part of the reseachers, and different use of software from study to study are just a few reasons that CAI research has not achieved a higher value among educators.

These problems and more made it necessary for Kulik, Bangert, and Williams (1983) to disregard data from 250 of 301 studies when they performed their analysis of the effectiveness of CAI. After analyzing data from 51 studies that ranged from sixth grade to tewlfth grade students hey found that on the average students scored thirteen percentile points higher on final examinations, they retained more information when reevaluated two to six months later, and they had better developed attitude towards subject matter than students not receiving CAI.

Buckley and Johnson noted dramatic cognitive growth was associated with the use os CAI at the Great Neck Adult Learning Center in a 1983 report. Some of the positive effects they noted were that CAI was individualized thus allowing students to move at their own rate unaffected by the performance of other students, CAI gives the students on-the-spot diagnosis of strength and weakness, thus allowing teachers to apply remediation as weakness were identified.

CAI can also be structured to allow students several benefits such as:

1) Limited time to responed to question.
2) Provides immediate feedback to the students as they work.
3) Provides a clear progress report to the students as they work.
4) Tends to encourage students to be selfdirected and to identify their own learning styles.
5) Enables students to identify improvement or regression in a specific skill area.
6) Has proven to be an invaluable learning tool for students and the way they perceive themselves as successful students.

In the review of literature we have seen a need for some type of remediation for those students in Idaho that fail the math section of the state Proficiency Exam. Thus the focus of this project will be to develop a guide to remediate through CAI those students who fail the math section of the Idaho Proficieny Exam.

CHAPTER III

Organization of The Project

Because of the substantiating facts presented in the review of literature and the inconsistent implementation of educational programs, this writer sees a need to initiate an effective remediation program for those who fail a basic competency math test. The focus of this project is to provide an effective CAI math remediation program.

In developing the project for this master's program, twenty - six competencies from the Idaho Proficiency Math section will be sequenced on a chart with suggestions for remediation of deficiencies for the Idaho Proficiency Math Exam. A chart will be developed containing the following : The twenty - six competencies found on the Idaho Proficiency Basic Math Exam, four different computer software packages, the coding of strengths of each software package, and secondary student age appropriateness.

The population, other than students, that will benefit from this project are teachers and administrators involved with the remediation of students failing the Idaho Proficiency Math Test. The benefits for teachers are the CAI materials that will provide guidance in remediation of individuals with math deficiencies indicated by the Idaho Proficiency Math Test. These materials will enable teachers to assist in the remediation of students in the regular classroom without losing valuable time. Students needing remediation will be able to stay in the regular classroom when remediation takes place. This will also allow other students the advantage of individualized remediation in the math curriculum, any time the need occurs, within the regular classroom. The benefit to administrators is the avoidance of legal issues surrounding the segregation of students that need remediation to pass the Idaho Proficiency Math Exam, thus hopefully avoiding any possible court cases as well as additional budget concerns.

As part of this project, a charting system will be designed. An analysis of the components of the Idaho Proficiency Math Exam will be undertaken.

Analysis of components of the competency test:

1) Types of problems on the test.
2) Algorithms.
3) Format of the test.
4) Vocabulary that is used on the test.

In analyzing the format of the test the following will be observed:

1) Objective multiple choice items.
2) Analysis of problems.
3) Time element needed to complete the test.

In analyzing the four sources of software packages the following charactertistics will be evaluation:

1) Objectives of the software.
2) Clarity of the software.
3) Appropriateness for the secondary school user.
4) Ease of use.
5) Teacher freedom from the software and student control of the software.
6) Software flexiability: the ability to move forward, backward, review a sequence or advance through a sequence.
7) The help if any offered to students within each software program when an error is made.
8) Record keeping ability software.

9) Special attributes offered in one software package that do not occur in another.

Teacher guidelines for availability:

1) Sources of the software availability.
2) Cost in purchasing the software.

The last process that will be taken into consideration for the completion of this chart is:

1) Approximate time for setting up a CAI remediation program.
2) Time length needed to complete a sequence in a software package.

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CAI Handbook For Remediation in Math

by

THOMAS JEFFREY SPADAFORE

A Project Presented in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts
in
Education

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CHAPTER IV

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INTRODUCTION

Consider the scenario: you are an eighth grade student who has taken the Idaho Proficiency Exam in February. The test is made up of four parts: math, reading, spelling and writing. If you have passed all four parts then you will receive the Idaho gold seal on your diploma when you graduate from high school. However if you are like the 5,950 students who did not pass all four parts of the Idaho Proficiency Exam in 1984, then you will have to retake and pass the section previously failed if you want a gold seal on your diploma.

The purpose of this handbook is to aid teachers whose students have failed the mathematics section of the Idaho Proficiency Exam. What follows will be a sequential procedure for a teacher to follow in planning a remedial program for such a student.

When the final eighth grade report card is mailed to students in Idaho, it includes a report on the Idaho Proficiency Exam. If they are among those who passed all four parts of the exam (56 % of 13,580 students in 1984) then a gold seal is assured. If they are among those who did not pass, they might need some type of remediation before they succeed in the exam retake. For those students who have failed any section of the exam, the report from the Idaho State Department of Education will indicate that some form of remediation is available. **This is the only warning that the parents will receive from the state of Idaho indicating that the student needs remediation and that he / she has not passed the Idaho Proficiency Exam.** Parents should take action immediately in contacting the school to seek needed help. The student data report mailed home indicates all the information required to show the student's deficiencies in mathematics. Take a minute to refer to Table 1 at the top of the page two. This is just the math section of the information sheet the State of Idaho, Department of Education mails to every student who takes the Idaho Proficiency Exam. It is labeled State of Idaho, Department of Education, Proficiency Testing, Student Data Report. Most secondary students have problems in a least one of the following areas, math facts, math concepts , and problem solving.

The following will also provide remedial CAI programs that will attempt to over come those problems areas. The instructor should become aware of the proper use of the software in the regard to these problems.

Table 1

DIST 001 BLDG 202
NAME :

STATE OF IDAHO
DEPARTMENT OF EDUCATION
** PROFICIENCY TESTING
** STUDENT DATA REPORT **

RUN DATE 06/02/84 PAGE 292

SUBJECT
MATHEMATICS

	OBJECTIVE	NO. ITEMS	ITEMS CORRECT	ITEMS NEEDED TO PASS	ACHIEVED + YES - NO
01	ADD FRACTIONS	3	3	2	+
02	MULTIPLY AND DIVIDE DECIMALS	4	4	3	+
03	ADD AND SUBTRACT DECIMALS	4	2	3	-
04	MULTIPLY FRACTIONS	4	4	3	+
05	EQUIVALENT FRACTIONS	4	3	3	+
06	DECIMAL TO PERCENT EQUIVALENTS AND VICE VERSA	4	3	3	+
07	FRACTIONS TO DECIMAL EQUIVALENTS	4	3	3	+
08	ADD WHOLE NUMBERS	4	4	3	+
09	SUBTRACT WHOLE NUMBERS	4	4	3	+
10	MULTIPLY WHOLE NUMBERS	4	4	3	+
11	DIVIDE WHOLE NUMBERS	4	4	3	+
12	BEST UNIT METRIC	4	4	3	+
13	UNIT CONVERSION MEASUREMENT	4	4	3	+
14	PARALLEL AND PERPENDICULAR	4	4	3	+
15	FIGURES RECOGNITION	4	4	3	+
16	AREA AND PERIMETER	4	4	3	+
17	WHOLE NUMBER APPLICATION OR MONEY PROBLEMS	4	4	3	+
18	AVERAGES	4	4	3	+
19	FRACTION APPLICATION	4	4	3	+
20	PERCENT APPLICATION	4	4	3	+
21	PROPORTIONAL PARTS	4	4	3	+
22	TIME	4	4	3	+
23	CHECKBOOK, BANK RECORDS	4	4	3	+
24	WAGES AND MONEY	4	4	3	+
25	CHANGE FROM $20, $10, $5	4	4	3	+
26	FORMULAS	4	4	3	+
	TOTAL	81	83	59	SUBJECT NOT PASSED

At this time identify the mathematics column that indicates objectives on this data sheet. Under the heading **OBJECTIVE** there are twenty - six math objectives listed. **The NUMBER ITEM** column indicates the number of items included on the exam, related to each objective.

In the **ITEMS CORRECT** column are the number of items relating to that objective which the student has completed correctly. **ITEMS NEEDED TO PASS** column indicates the number of correct responses required to pass a given objective. The far right hand column is labeled **ACHIEVED, yes / no:** if there is a "- " in the column, this indicates that the objective was not met; if there is a "+" in the column, then the objective was met and passed. At the bottom of the mathematics section there is a line indicating totals for passing or failing.

BEST COPY AVAILABLE

If the student has not completed the requirement set for a given subject area, then it will be so indicated with the phrase **SUBJECT NOT PASSED.**

After the student or parent has taken action to seek remedial assistance, a teacher can utilize this handbook to plan remediation for the mathematics section. In using this handbook a teacher will need the student data report to determine where a student has failed a math objective. On the student data report there are twenty - six mathematical objectives listed and briefly defined. These are the same objectives that have been used for this handbook; they are in the same order as on the exam. For the full understanding of the twenty - six objectives see the attached Idaho Basic Proficiencies in Math provided on page nine. First a teacher will need to check the **ACHIEVED** column on the student data report to identify the objectives that were failed. The teacher should then cross reference the objectives failed with the remediation chart listed on page eleven of this handbook. On the remediation chart the teacher will find a definition of objectives and the software programs that will aid in the remediation for that specific objective. If you find the above confusing, here is a check list of how you, as a teacher, would use this handbook for planning the remediation of mathematics in relation to the Idaho Proficiency Exam.

1) Receive information from the school or parents that a student needs remediation in mathematics in relation to the Idaho Proficiency Exam.

2) Obtain a copy of the student's data report that was sent home.

3) Identify where in the ACHIEVED colmun a negative (-) mark occurs.

4) Cross reference negative marks with the objective that has been stated for competency.

5) Match those competencies that need remediation with the objectives on the remediation handbook.

6) Use the chart and decide which computer software program will best aid in the remediation of the failed objective.

Remedial implementation will be discussed in the next section.

IMPLEMENTATION

Using the failed objectives which have been identified the teacher is ready to start the remediation process. An implementation plan should be developed so that the teacher and the student have the same goals. Here the handbook can become a major asset to a regular classroom teacher or any other teacher who has a student needing remediation. With the handbook and the test information now at hand a flexible remediation program can be implemented.

The flexibility provided by this remediation program can aid in easing the burden of finding time for the teacher and the student for quality remedial instruction. The following are four possibilities for incorporating remediation into a students program.

Example one: A student in the regular classroom could benefit from this remediation program because regular class work can be continued and special time arrangements can be established on a contractual basis for CAI remediation. Perhaps each day or every other day in that teacher's class the student would work on CAI in the remediation of math in accordance with the handbook. The teacher could then check to see if a certain omission has been remediated.

Example two: Using the computer before and after school for remediation purposes is also a possibility. The teacher and / or the person in charge of the computers could arrange for the student to use the computers for CAI in math. This would allow the student to use the computers at a time when the teacher would be able to aid in the explanation of problems presented by the computer software. The teacher would ask the student questions that may cause the student to look at the problem from a different perspective. Of all methods in the implementation of the handbook this would be the ideal situation for remediation, because the student would receive immediate feedback from the computer and would have the teacher available to aid in the process in solving the problem correctly.

Example three: Remediation available to the students could be presented in the computer lab at school. There could be scheduled times during the day for groups of students to receive special remediation for math in the computer lab. A math teacher could supervise the lab and aid in the remediation process. The possibilities of this type of program are endless if an administrator would consider the following; the school could offer special CAI summer school classes in the remediation of math: there could be groups of students that attend special classes before school starts and after school ends for remediation in math; there could be night classes for students who are involved in extracurricular activties after school. The number of ways the computer lab could be used for remediation of mathematics along with this handbook are only limited by one's imagination.

Example four: A library - learning center is another possibility. Here the computers could be set up in the library and the librarian could check out the software. The students needing remediation could then receive the needed help whenever they had free time to go to the library, or whenever a teacher allowed them to leave the regular classroom to receive CAI in math.

After the method of implementation has been decided the teacher will have to consider the learning rate of a student in relation to the number of concepts to be taught. The reason for this is that the Idaho Proficiency Exam is only administered once a year, in February. If a student needs only mild remediation and remediation is administered too early, the chances of that student retaining the information until the retest decreases. But, if a student could receive the remediation process at an approparate time in advance of retaking the exam, the student should be able to retain more information. The remediation process should differ among students in relation to the severity of the indiviual's problems. Planning should provide the student the greatest amount of practice as close to exam retake time as possible. This schedule should provide the greatest probability of success on the retake of the examination.

EVALUATION

Throughout the process of CAI the evaluation of a student's progress by the teacher is very important. This handbook provides a source of information to help remediate a student's deficiencies in math; it is not a panacea to guarantee the successful passage of the Idaho Proficiency Exam. The software itself must elicit from adolescents a confidence that it will indeed aid in the remediation of their problems. Hence "secondary school age appropriateness" indicates whether the disk uses vocabulary, reinforcement and feedback that is consistent with the respective developmental levels of the secondary student.

Although most computer software has some type of examination at the end of each lesson, not all software has an evaluation available as noted below with the software used in this handbook. MECC has a built in test in most of the software programs they produce, but there are software programs that do not test mastery of a skill. Milliken software has a daily record keeping system for problems attempted by a student and a test application process in each software program with the ability of setting mastery levels for a student. SBC and MCPPLS software have immediate feedback to each question as does MECC and Milliken, but SBC and MCPPLS have no testing to assure the mastery of a skill.

To assure mastery, teachers should construct some type of evaluation process that will test the mastery of identified objectives that the student has attempted to master. Ideally this evaluation should be conducted at the completion of the work related to a given objective. The Idaho Proficiency Exam is administered in the traditional way with paper and pencil; for this reason any evaluation that takes place should be done with paper and pencil, This would insure that students have transfered the information from the computer to paper and pencil and will also give them the knowledge that mastery of a particular objective missed on the Idaho Proficiency Exam has now been completed.

Computers provide extensive possibilities for remediation. This handbook harnesses computer technology and allows teachers to use it

for defined purposes and provides a powerful remediation tool for teachers and students. Hopefully this tool will also make the remediation process much more enjoyable for both the teachers and the students.

IDAHO BASIC PROFICIENCIES IN MATH

Mathematics Computation

1. Add two fractions having unlike denominators.
2. Multiply and divide any two decimals with no more than two decimal places.
3. Add and subtract decimal numbers having no more than two decimal places when given in vertical or horizontal format.
4. Multiply any two fractions or a fraction and a whole number.
5. Select equivalent fractions from a list of fractions.
6. Change a percentage to an equivalent decimal form or a decimal to a percentage.
7. Change a common fraction to a decimal form.
8. Add any three whole numbers up to four digits long.
9. Subtract any two whole numbers up to five digits long.
10. Multiply any two whole numbers up to three digits long.
11. Divide any whole number by a one or two digit whole number divisor and write a remainder (if any) as a proper fraction.

Mathematics Application

12. Select appropriate metric units for length, volume (capacity), and weight (mass).
13. Convert from one unit of measurement to another within the conventional or metric system.
14. Recognize horizontal, parallel, perpendicular, vertical, and diagonal lines.
15. Recognize a triangle, rectangle, square, parallelogram, or circle.
16. Compute perimeters and areas of simple polygons.
17. Solve simple written (story) problems, in which the solution will require at least one of the four fundamental operations with whole numbers.
18. Find the average of up to five two digit numbers

19. Solve written problems, the solution to which will require addition or multiplication of fractions.

20. Solve a written problem involving a percent of a whole number.

21. Solve a simple problem involving proportional parts.

22. Solve a simple problem involving time.

23. Keep a bank record with simple deposits and withdrawals.

24. Compute his/her salary based on number of hours employed and salary per hour.

25. Determine the solutions to real world problems involving purchases totaling less than ten dollars with change from a twenty dollar bill.

26. Substitute given values into either a formula or equation and obtain the correct result.

CAI Guide For Remediation in Math

Software Code :

MECC	=	Minnesota EducationalComputing Consortium.
SBC	=	Sunburst Communation Software.
IOWA	=	Price Laboratory Software Project.
Milliken	=	Milliken Math Software Series.

Code :

+	=	Record keeping ability and any special fetures.
*	=	Teaches to competency area.
S	=	Strong secondary school age appropriateness.
M	=	Moderate secondary school age appropriatemess.
W	=	Weak secondary school age appropriateness.

Secondary school age appropriateness indicates whether the disk uses vocabulary, reinforcement and feedback that is consistent with the respective developmental levels of the secondary student.

The software listed on this chart is compatable to the Apple family computers.

	MECC	SBC	Iowa	Milliken
1. Add two fractions having unlike denominators.	* S Growgins Fractions.	* S Foreman's Asst. Disk 1	* S Middle School. Disk 7 & 8	* + S Lesson 17 & 18 Fraction Disk.

	MECC	SBC	IOWA	MILLIKEN
2. Multiply and divide any two decimals with no more than two decimal places.	* S Auto. Tech. Math. Vol. 2	* S Hot Dog Stand. Disk 1	* S Middle School. Disk 3	* + S Lesson 40 - 56 Decimal Disk.
3. Add and subtract decimal numbers having no more than two decimal places when given in vertical or horizontal format.	* W Addition Logician.	* S Hot Dog Stand. Foreman's Asst. Disk 1	* M Middle School. Disk 1	* + S Lesson 12 - 30 Decimal Disk.
4. Multiply any two fractions or a fraction and a whole number.	* S Auto. Tech. Math. Vol. 1	* S Foreman's Asst. Disk 1	* S Middle School. Disk 7 - 8	* + S Lesson 28 - 32 Fraction Disk.
5. Select equivalent fractions from a list of fractions.	* S Auto. Tech. Math. Vol. 1		* S Middle School. Disk 8	* + S Lesson 1 - 3 Fraction Disk.

	MECC	SBC	IOWA	MILLIKEN
6. Change a percentage to an equivalent decimal form or a decimal to a percentage.	* M Auto. Tech. Math. Vol. 2	* S Smart Shopper. Disk 1	* S Middle School. Disk 12	* + S Lesson 1 - 5 Decimal Disk.
7. Change a common fraction to a decimal form.	* M Auto. Tech. Math. Vol. 1 Vol. 12		* S Middle School. Disk 8	* + S Lesson 36 Decimal Disk.
8. Add any three whole numbers up to four digits long.	* W Circus Math.	* S Hot Dog Stand. Disk 1	* S Middle School. Disk 2	* + S Lesson 46 - 60 Addition Disk.
9. Subtract any two whole numbers up to five digits long.	* W Addition & Subtract Vol. 2	* S Travel Agent. Foreman's Asst. Disk 1		* + S Lesson 23 - 50 Subtract Disk.

	MECC	SBC	IOWA	MILLIKEN
10. Multiply any two whole numbers up to three digits long.	* W Elem. Vol. 1	* S Hot Dog Stand. Disk 1	* M Middle School. Disk 3	* + S Lesson 43 - 60 Multiplication Disk.
11. Divide any whole number by a one or two digit whole number divisor and write a remainder (if any) as a proper fraction.		* S Hot Dog Stand. & Foreman's Asst. Disk 1		* + S Lesson 10 - 21 & 52 - 64 Divison Disk.
12. Select appropriate metric units for length, volume (capacity), and weight (mass).	* W Game Elem. Vol. 1			
13. Convert from one unit of measure to another within the conventional or metric system.	* W Elem. Vol. 1	* S Foreman's Asst. Disk 1		

	MECC	SBC	IOWA	MILLIKEN
14. Recognize horizontal, parallel, perpendicular, vertical, and diagonal lines.	* S Geometry Elem. Vol. 9	* S Foreman's Asst. Disk 1	* S Middle School. Geometry. Disks 2 & 3	
15. Recognize a triangle, rectangle, square, parallelogram, or circle.	* S Geometry Elem. Vol. 3	* S Foreman's Asst. Disk 1	* S Middle School. Disk, 5 Geometry. Disks 1,2 & 3	
16. Compute perimeters and area of simple polygons.	* S Geometry Elem. Vol. 10	* S Smart Shopper. Disk 1	* S Middle School. Disk 9	* + S Lesson 9 - 16 Measurement Disk.
17. Solve simple written (story)problems, of which the solution will require at least one of the four fundamental operations with whole numbers.	* S Problem Solving.	* S Travel Agent.& Hot Dog Stand. Disk 1	* S Algebra I Disk 2	

	MECC	SBC	IOWA	MILLIKEN
18. Find the average of up to five two digit numbers.			* S Middle School. Disk, 13	
19. Solve written problems, the addition or multiplication of fractions.	* S Adventures With Fractions.	* S Foreman's Asst. Disk 1	* S Middle School. Disks 7 & 8	* + S Lesson 20 - 25 28 - 32 Fraction Disk.
20. Solve a written problem involving a percent of a whole number.	* M Auto Tech. Math. Vol. 2	* S Smart Shopper. Disk 1	* S Middle School. Disk 12	* + S Lesson 7 - 15 Percent Disk.
21. Solve a simple problem involving proportional parts.				
22. Solve a simple problem involving time.	* M Problem Solving. Estimation.	* S Travel Agent. Disk 1		

	MECC	SBC	IOWA	MILLIKEN
23. Keep a bank record with simple deposits and withdrawals.	* S Business Vol. 1	* S Travel Agent. Disk 1		
24. Compute his/her salary based on number of hours employed and salary per hour.				
25. Determine the solutions to real world problems involving purchases totaling less than ten dollars with change from a twenty dollar bill.	* S Estimation Disk A - 124. Computer Generated Math. Vol. 2	* S Hot Dog Stand & Smart Shopper Disk 1		
26. Substitute given values into either a formula or equation and obtain the correct result.	* S Mathematics Vol. 1	* S Foreman's Asst. Disk 1	* S Algebra II Disk 9	* + S Lesson 1 - 25 Measurement Disk.

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